Superfund Proposed Plan
Riverfront Site - OU 1
Front Street Site
New Haven, Missouri

EPA
Region 7

July 2003

I. PURPOSE OF PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for Operable Unit 1 (OU1), the Front Street Site, one of the areas of the Riverfront Superfund Site in New Haven, Missouri (an operable unit is a discrete portion of a larger overall cleanup). This Proposed Plan identifies the preferred remedial alternative and the rationale for this preference. The Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA), as lead agency, with support from the Missouri Department of Natural Resources (MDNR), and is being issued as part of EPA's public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or the Superfund Statute) of 1980, as amended, and Section 300.430(f) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This Proposed Plan is being provided as required by the Superfund Statute, in coordination with the state of Missouri to: 1) inform the public of the EPA's preferred remedy; 2) highlight key information in the administrative record, especially the Remedial Investigation (RI) and the Feasibility Study (FS) Reports; 3) describe the remedial alternatives analyzed during the FS, and; 4) solicit public comments pertaining to the preferred alternative as well as all the remedial alternatives evaluated. The Riverfront Superfund Site consists of six OUs in and around the city of New Haven. Other Proposed Plans have been or will be developed to describe the alternatives for the other OUs.

Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after the EPA has taken into consideration all public comments made during the comment period. The final decision will be contained in a Record of Decision (ROD) issued by the EPA.

II. COMMUNITY ROLE IN SELECTION PROCESS

The EPA and the MDNR rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. The Administrative Record for this Site, which includes such documents as the Baseline Risk Assessment, the RI Report, the FS Report, and supporting documentation has been made available to the public for a thirty-day public comment period which begins on July 24, 2003, and concludes on August 22, 2003. All information considered in the development of this Proposed Plan is included in the Administrative Record for public review.

A public meeting will be held on July 29, 2003, at the Trinity Lutheran Church, New Haven, Missouri, to receive public comments.

Comments received at the public meeting, as well as written comments submitted during the comment period, will be addressed in the Responsiveness Summary which will be attached to the ROD (the document which formalizes the selection of the remedy).

All written comments should be addressed to:

Hattie Thomas, Community Involvement Coordinator
Office of External Programs
U.S. EPA, Region 7
901 N. 5th Street
Kansas City, Kansas 66101
Telephone: 1-913-551-7003 or
Toll-free 1-800-223-0425

Dates to remember:
MARK YOUR CALENDAR

July 24, 2003, to August 21, 2003
Public Comment Period for the Remedial Investigation (RI) report, the Feasibility Study (FS) report, and EPA's Proposed Plan.

July 29, 2003
Public Meeting at the Trinity Lutheran Church, New Haven, Missouri, at 7:00 p.m.

Copies of the project documents are available at the following repositories:

New Haven Scenic Regional Library
109 Maupin
New Haven, Missouri

EPA, Region 7 Records Center
901 N. 5th Street
Kansas City, Kansas
Hours:
Monday - Friday (8:00 a.m. - 5:00 p.m., C.D.T.)

Supporting information can be found at the website, missouri.usgs.gov/epa/nh.

III. SITE BACKGROUND

New Haven (population 1,600) is located along the southern bank of the Missouri River in Franklin County, Missouri, about 50 miles west of St. Louis, Missouri (Figure 1). The principal road, State Highway 100, runs along an east-west trending ridge about 1 mile south of the Missouri River. The ridge forms a topographic divide between the Missouri River valley to the north and the Boeuf Creek valley to the south.

In 1986, the volatile organic compound (VOC), tetrachloroethene (PCE), was detected in two public-supply groundwater wells (Wells W1 and W2) in the northern part of New Haven. Following the discovery of contamination, two new public-supply wells were installed in the southern part of the city, and several investigations were conducted by the MDNR and EPA. The Site became known as the Riverfront Site, and in December 2000, the PCE contamination prompted the listing of the Riverfront Site on the National Priorities List (NPL). (The NPL is a list compiled by EPA pursuant to CERCLA of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response.)

The Riverfront Site encompasses six OUs in and around the city of New Haven. The OUs have been designated by EPA based on the results of prior investigations and information received through interviews with local citizens regarding waste generation and disposal. These areas include facilities which are possible sources of the PCE contamination. These include an abandoned manufacturing building in the downtown area (OU1), a metal fabrication plant in south New Haven (OU2), the Old City Dump (OU3), an undeveloped area south of the contaminated city well #2 (OU4); an abandoned hat factory (OU5); and an area containing contaminated domestic wells south of the city (OU6).

The EPA began an RI in June 2000 and focused this effort at OU1, the Front Street Site, and OU3, the Old City Dump Site. An FS for each of these two areas began in the summer of 2002.

This Proposed Plan focuses on OU1, the Front Street Site. Various industries have operated at the Front Street Site since the 1950s. In the 1950s, the New Haven Manufacturing Company (NHMC) began operating at the Site. The NHMC operated at the Site until 1972. PCE was used as a degreasing solvent in the manufacturing operations of the NHMC. The EPA has confirmed that waste PCE was washed out of the south doors of the building, where it pooled in low areas along the south side of Front Street.

From 1983 to 1989, Riverfront Industries operated at OU1. Riverfront Industries may also have used and dumped PCE. Since 1989, the Site has been occupied by Transportation Specialists, Inc. (1989 - 1993), who did not use PCE and by Wiser Enterprises, Inc. (1997 - present), which is known to have used small amounts (occasional use of 16-ounce cans) of PCE.

There has been one previous removal action at the Front Street Site. In July 2000, EPA conducted an emergency removal action to replace a contaminated plastic water supply line which served a public restroom east of the Front Street Site. The EPA removed approximately 1,000 tons of PCE-contaminated soils.

Information gathering by EPA has identified no viable Potentially Responsible Parties (PRPs) at this time.

Public participation activities prior to the issuance of this Proposed Plan included several community meetings, distribution of fact sheets, publication of notices, assistance in the formation of a Community Advisory Group (CAG), development of a Riverfront website for public use, attendance at city council meetings and participation in discussions within the community regarding future use of the land and groundwater.

Site Characteristics

The Front Street Site is located on the northeast corner of Front Street and Cottonwood Street, just east of downtown New Haven. The Site consists of a 15,000-square foot, one story, concrete building (the Front Street Building), and vacant lots to the east and west of this building. The largest PCE concentrations were detected in the soils beneath Front Street along the south side of the building.

A plume of groundwater contaminated with PCE and its degradation products begins below the Front Street Site and extends northeast to the Missouri River. The plume passes under two residential properties as it migrates to the river.

The Front Street Site is located on the south side of the Missouri River alluvial plain, just north of a bluff. The Site is protected by a flood control levee to the north. Bedrock below the Site varies from approximately 29 feet below ground surface (bgs) to the southeast (nearest the bluff) to approximately 38 feet bgs to the north. Bedrock continues to drop off steeply to the north below the groundwater plume. At the Missouri River, bedrock is 56 feet bgs. A layer of

medium to fine silty sand covers the bedrock surface to approximately 20 feet bgs. The upper 20 feet of the soil is mostly silt.

The depth to groundwater depends on the stage of the Missouri River. Normally, the depth varies from 10 to 12 feet bgs after the spring floods to around 20 to 22 feet bgs in late summer/early autumn. However, in times of prolonged flooding, the depth to groundwater can be zero feet, while during the drought year of 2002 the depth to groundwater fell to 26 feet bgs. Generally, groundwater in the sand and silt flows northeast into the Missouri River at between 35 and 58 feet per year. During flood stage, the groundwater flow into the river may stop or even reverse.

Results of Site Investigations

The Front Street Site has been extensively investigated. Samples have been collected from trees, soils, and groundwater at the Site and in the vicinity to define the extent of contamination. Contaminated soils and groundwater are present at the Site.

Tree-core samples were collected because the levels of PCE in the cores were found to correlate with the levels of PCE in the soil and groundwater below the tree. The tree-core PCE results indicated that the highest PCE concentrations were along the south side of the Front Street Building.

Three phases of soil sampling were conducted at the Front Street Site. PCE was detected at 128 of the 144 soil sampling locations. The concentrations of PCE vary substantially with depth and the boring's location across the Site. The maximum PCE concentration detected at the Site was 6,200,000 micrograms per kilogram (ug/kg) found in a sample collected four feet deep beneath Front Street. Based on the sampling results, EPA has estimated that approximately 34,000 cubic yards of soils below the Front Street Site are contaminated with some level of PCE.

Four phases of groundwater sampling have been conducted at the Site. In Phases I and II, six monitoring wells were installed in the alluvium and four monitoring wells were installed in the bedrock. During Phases III and IV, direct push temporary wells were installed (21 in Phase III and 6 in Phase IV). PCE and its degradation products (trichloroethene [TCE], cis-1,2-dichloroethene [cis-DCE], and vinyl chloride [VC]) were detected in many of these samples. The maximum PCE concentration detected in the groundwater at the Site was 11,000 micrograms per liter (ug/L). Based on the sampling results, a plume of PCE-contaminated groundwater extends from the Site to the Missouri River and contains about 5.8 million gallons of water. Plumes of degradation products are located within the PCE plume.

Water and sediment samples were also collected from the Missouri River. PCE and its degradation products were not detected in any of the water or sediment samples from the river.

IV. SCOPE AND ROLE OF OU 1

OU1 is part of an overall cleanup of the Riverfront Site that includes six separate OUs in combination with short-term response measures performed under CERCLA removal authority. OU1 is a discrete area of contamination that does not affect, and is not affected by, other OUs at the Riverfront Site. OU1 and OU3 are the first OUs at the Site that have progressed to the remedy selection phase. Other OUs will be addressed in subsequent phases.

OU1 addresses soils and groundwater impacted by releases of materials that occurred at or near the former manufacturing facility on Front Street. These releases have resulted in a localized area of soil contamination and a relatively narrow plume of contaminated groundwater that flows from the former facility and discharges into the Missouri River. This material is not contributing to the PCE contamination which affected the city's closed public water supply wells. The OU1 plume is not adversely affecting any other current drinking water sources or surface water quality in the Missouri River. Contamination in soil is limited to subsurface soils in the immediate vicinity of the Front Street facility at depths of two feet or greater. There is no current exposure to contaminated soils associated with OU1, unless the soil surface is disturbed.

Since completion of the sampling that characterized the extent of groundwater contamination associated with OU1, additional sampling has been performed in the residences located above or adjacent to the groundwater plume to determine if indoor air quality is being adversely affected by organic vapors emanating from the plume. This sampling has identified the presence of elevated organic vapors in one of these residences that may be related to vapor intrusion from contaminated groundwater beneath the home. Additional sampling is ongoing to determine if indoor air quality is, in fact, being impacted by the contaminated groundwater plume and if health-based levels are exceeded.

If EPA determines that interior vapor concentrations in the residence above the contaminated plume are related to the Front Street releases and that these vapor concentrations pose an unacceptable risk to affected residents, appropriate response measures will be considered and implemented by EPA. Such measures could include installation of a ventilation system to remove contaminated vapors from living areas within the residences or other effective action. This work, if required, will be performed using CERCLA *removal* authority which allows the EPA to perform immediate actions to protect human health and the environment. This document proposes remedial or long-term measures to address the PCE contamination in soils and groundwater. Hence, the indoor air quality is outside of the scope of this Proposed Plan and will be addressed through the more immediate removal process.

V. SUMMARY OF SITE RISKS

As part of the RI/FS, a complete assessment of the human health risk at OU1 was conducted by the Missouri Department of Health and Senior Services (MDHSS). This report, *Baseline Risk Assessment Operable Unit 1 (OU1) - Front Street* contains detailed information on the current and future risks of the Site's contaminants to human health. An assessment of the ecological risks for OU1 can be found in the *Ecological Risk Assessment,* prepared for EPA by Black & Veatch Special Projects Corp. (BVSPC). None of the residences or businesses near OU1 have domestic wells that could be affected in the future by contaminants migrating from the Front Street Site. A future occupational worker, resident, or recreational user at the Site could potentially be affected.

Currently (July 2003) there is no human exposure to the contaminants migrating from the Site, with the possible exception of indoor air concerns. It is the EPA's current judgment that the preferred alternative identified in this Proposed Plan, or one of the other measures considered in the Proposed Plan, will protect public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment.

Human Health Risk Assessment

The MDHSS prepared a Baseline Risk Assessment (RA) using the data collected during the RI. After the RI and FS Reports were completed, additional field investigations were conducted at the Site. The RI and FS reports, together with this additional information, serve as the basis for determining appropriate action at the Site. These documents are available for review in the Administrative Record prepared for the Riverfront Site.

The MDHSS evaluated exposure to carcinogenic and non-carcinogenic contaminants at OU1. The major contaminants include PCE, TCE, cis-DCE, and VC. Additional contaminants detected were benzo(a)pyrene and arsenic.

There was no excess cancer risk for current residents downgradient of the Front Street Site because current residents are not exposed to carcinogenic contaminants from the Site due to ingestion of contaminated groundwater or contact with contaminated soils. The MDHSS calculated carcinogenic risks for several current and future exposure scenarios. (See the box on risk for a summary of the risk calculation.) The risks are summarized on Table 1. The excess cancer risks for two of these future hypothetical exposure scenarios are greater than the EPA's threshold for unacceptable cancer risk of 1 x 10^{-4} (an unacceptable risk). These risks would occur, however, only in the event that the assumed future exposure scenario would actually occur. If exposure levels remain at current levels, these unacceptable risks will not occur.

Risk is estimated using a four-step process:

Step 1: Analyze contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk.

In Step 1, EPA looks at concentrations of contaminants found at a site, as well as scientific studies regarding health effects.

In Step 2, EPA considers the different ways people might be exposed to contaminants identified at the site. EPA calculates a "Reasonable Maximum Exposure" which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2, combined with toxicity information of each chemical to assess potential health risks. The likelihood of any kind of cancer resulting from a Superfund site is described as a probability; for example, "1 in 10,000 chance." It means that for every 10,000 people exposed, one extra cancer *may* occur. An extra cancer means that one more person could get cancer than would normally be expected to from all other causes. EPA considers a risk unacceptable when the total excess lifetime cancer risk for a reasonable maximum exposure exceeds 10^{-4} (1 in 10,000). Total excess lifetime cancer risks below 10^{-6}, (1 in one million), are considered acceptable.

For non-cancer health effects, EPA calculates a "hazard index." The key concept here is that a "threshold level" (measured as a hazard index of less than 1) exists below which non-cancer health effects are no longer predicted.

In Step 4, EPA determines whether site risks are great enough to cause health problems for people at or near the Superfund site. The results of the three previous steps are combined, evaluated, and summarized. The EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

There were no non-carcinogenic risks for current residents downgradient of the Front Street Site, because current residents are not exposed to any non-carcinogenic contaminants from the Site. As required by EPA's Risk Assessment Guidance, "hazard indexes" (which estimate non-carcinogenic risks) for several hypothetical risk exposure scenarios at the Site were also calculated. These risks are also summarized in Table 1. The hazard indexes for the future resident and future workers exposure scenarios were greater than EPA's threshold hazard index level of 1, so there could be excessive non-carcinogenic risks from the Site if those particular future exposure scenarios actually occurred. The hazard indexes for the other three exposure scenarios were all less than 1, so there should not be an unacceptable level of non-carcinogenic risks from the Site for those exposure scenarios.

Because a public-water supply is available at the Site, it is extremely unlikely that wells would be installed at the Site to supply water to residents or future workers. Therefore, the future non-carcinogenic risk to workers or residents at the Site due to ingestion of contaminated groundwater can reasonably be estimated to be zero.

Table 1

Summary of Risks for OU1

Risk Scenario	Carcinogenic Risk	Non-Carcinogenic Risk
Current Trespasser	5.3×10^{-6}	Less than 1 (0.06)
Future Resident	1.82×10^{-3}	12.3
Future Worker	3.39×10^{-4}	3.08
Future Recreation	2.1×10^{-5}	Less than 1 (0.06)
Current or Future Utility Worker	1.1×10^{-6}	Less than 1 (0.05)

The risk values in Table 1 are the values in the MDHSS RA.

Ecological Risk Assessment

An Ecological Risk Assessment indicated that the potential for significant ecological impacts from OU1 is small. State and Federal Threatened and Endangered Species exist within Franklin County, however, none of these species are known to exist at OU1. However, the presence of suitable habitat within the vicinity indicates that there is potential for these species to be present.

Surface water analytical results from the Missouri River did not detect any contaminants. Therefore, the concentrations in the Missouri River were below the Ecological Screening Values, which determine the ecological risks.

VI. ALTERNATE CONCENTRATION LIMITS

The EPA generally seeks to return usable groundwater to beneficial use whenever practicable. When contaminated groundwater is currently or potentially used as a drinking water source, EPA typically selects a remedy that will restore the groundwater to achieve Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) established under the Safe Drinking Water Act. The EPA develops Remedial Action Objectives (RAOs) for each site, and these describe the goals that the Site cleanup is expected to accomplish. The RAOs may vary for different portions of the same site (i.e., reduce contaminant concentrations in soil; return groundwater to drinking water use). The RAOs are designed so that it is safe for the reasonably anticipated future land use at the Site.

Under limited circumstances specified in CERCLA Section 121(d)(2)(B)(ii), (the Superfund statute), Alternate Concentration Limits (ACLs) may be used instead of drinking water standards (typically, MCLs or MCLGs). This allows flexibility in establishing groundwater cleanup levels. There are specific circumstances when ACLs can be used and these are as follows:

- the contaminated groundwater has "known or projected" points of entry to a surface water body;
- there must be no "statistically significant increases" of contaminants in the surface water body at those points of entry, or at points downstream; and
- it must be possible to reliably prevent human exposure to the contaminated groundwater through the use of institutional controls.

The 1990 NCP preamble advises that ACLs are not to be used in every situation in which the above conditions are met, but only where active restoration of groundwater is "deemed not to be practicable". To determine what is "practicable", EPA uses the October 1996 EPA guidance document, "Presumptive Response Strategy and Ex-situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites." The term "practicability" refers to an overall finding of the appropriateness of groundwater restoration, based on evaluating remedy selection criteria, which are summarized below in the "Evaluation of Alternatives" section of this document and defined in Section 300.430(e)(9)(iii) of the NCP. The five primary balancing criteria are long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost. The two modifying criteria include state and community acceptance.

The EPA has determined that conditions at the Riverfront Site meet the criteria to support the use of ACLs for OU1. The following information documents this finding.

Criteria 1: Extensive sampling performed during the RI and during subsequent field investigations has defined the contaminant plume boundary with a high degree of confidence. The contaminated groundwater plume originates at the Front Street facility and flows to the northeast approximately 600 feet where it enters the Missouri River. At the widest cross-section, just before entering the Missouri River, the plume attains a maximum width of approximately 300 feet. Data collected during the RI have indicated the region where the contaminated groundwater enters the Missouri River. This is the "known or projected" point of entry into the surface water body.

Criteria 2. A conservative analysis has been performed to determine the maximum impact that the plume (the contaminated shallow aquifer) could have on the Missouri River water quality. The analysis conservatively assumes that the highest contaminant concentration discharges directly into the Missouri River. This concentration is 11,000 ug/L PCE, which was detected in the source area beneath the Front Street facility. Sampling has demonstrated that PCE concentrations are actually reduced at least one order of magnitude before reaching the discharge point and entering the Missouri River. The latest data (PCE at 41 ug/L in well G) is a reduction of more than two orders of magnitude from the assumed discharge concentration of 11,000 ug/L. The analysis further assumes that this plume discharges continuously for a distance of 400 feet along the Missouri River. The analysis assumes that this plume does not mix with the surrounding water as it enters the river. (Turbulent conditions at the base of the river would actually result in instantaneous mixing with thousands of cubic feet of surrounding river water, even during low flow conditions.)

Therefore, even using these extremely conservative assumptions, the analysis concludes that the maximum concentration that could occur at the downstream limit of the discharge zone in the Missouri River would be 1.2 ug/L PCE. This is well below the drinking water MCL value and the Missouri Water Quality Standard for protection of aquatic life which is 5 ug/L. In reality, PCE concentrations would be non-detectable due to the extremely slow rate of PCE discharge from the plume into the river and the mixing that occurs immediately upon entering the river. During the RI, sampling of the Missouri River near the discharge zone of the plume has confirmed that PCE concentrations are below detection limits.

Contaminant concentrations in the Missouri River resulting from the plume are not expected to significantly increase above the current non-detectable levels. The release of site contaminants into the source area occurred decades ago, and the plume has attained a near steady-state condition. No mechanism exists for the impact to the Missouri River to increase, since the discharge rate of contaminants is expected to continue at the present rate or decline in the future. Contaminant concentrations near the discharge zone can be monitored to confirm this trend.

Criteria 3. To reliably prevent future exposure to contaminated groundwater associated with OU1, enforceable measures are in place and can be supplemented with additional institutional controls.

For example, the flood protection levee surrounding downtown New Haven is owned by the city but was constructed by the U.S. Army Corps of Engineers (USACE) using federal funds. The city is responsible for maintenance of the levee and ensuring that stringent guidelines and restrictions for construction and other activities near the levee are followed. The levee is inspected and certified annually by the USACE. In order to maintain certification from the USACE, the city must ensure that guidelines and restrictions are followed; these include controlling subsurface excavations or borings within 500 feet of the back of the levee. Any person or entity wishing to drill a well/boring must first submit a plan to the city. The city then submits the plan to the USACE, who reviews the plan and makes recommendations to the city to approve, disapprove, or suggest modifications to the plan. The city then makes the final decision on the proposed boring or drilling. If the city does not ensure the guidelines are followed, they risk losing certification of the levee by the USACE, which would severely affect flood insurance rates in the area.

Additional measures are underway that will establish other institutional controls providing further assurance that exposure to contaminated groundwater will not occur. Under an arrangement between the current owner, a local not-for-profit organization, and the city of New Haven, it is expected that ownership of the Front Street facility may pass to the city in the near future. The EPA expects that a component of this transaction will include the imposition of certain institutional controls that will further prevent potential human exposure to contaminated groundwater. These measures include:

- the institution of a control that will prohibit well drilling in the area impacted by the OU1 groundwater plume. The control would also require consultation with the state and/or EPA, prior to excavation or other soil-disturbing activities in the affected area; and
- granting access to EPA and the state for any necessary monitoring, maintenance, or response that may become necessary in the future.

The EPA has further determined that the restoration of shallow groundwater impacted by OU1 is not practicable due primarily to short-term effectiveness, implementability, and cost considerations. These are three of the five balancing criteria that EPA must evaluate. The high cost associated with restoring the contaminated alluvial aquifer to meet MCLs is not warranted due to other problems associated with the use of this aquifer as a drinking water source and the readily available public water supply.

The groundwater impacted by the contaminated plume that is the subject of this Proposed Plan is a low-yielding alluvial aquifer of generally marginal quality. This aquifer has not been used for a drinking water source since the early 1900s. The saturated zone of the aquifer is 10 - 15 feet in thickness which results in yields that are far too low to support any public water supply. Domestic water in the area is readily available from the city's current public water supply system.

Testing of the shallow aquifer impacted by OU1 has identified water quality problems unrelated to releases of hazardous substances from the Front Street facility. Iron and manganese levels exceed Missouri MCLs and EPA secondary drinking water standards. Manganese levels have been identified in this groundwater that exceed the Missouri MCL by factors up to 30 times. The aquifer is also affected by high dissolved solids and taste and odor problems.

Other concerns exist regarding future drilling in the area affected by the OU1 plume south of the flood control levee. Any well drilled on the flood-protected side of the levee in the affected area would require more costly, specialized techniques for installation and completion of the well to protect the stability of the levee during flood events.

The use of this low-yielding marginal quality alluvial aquifer as a future drinking water source is not readily conceivable. The high short-term impacts, difficulties with implementation and the high costs associated with alternatives that would result in attainment of MCLs for contaminants related to the OU are not justified on the basis of any benefit that would result from achieving these levels. Having achieved the MCL levels for the OU1 contaminants, the shallow aquifer would still be considered a marginal drinking water source due to problems with low yield, high levels of minerals and dissolved solids, and taste and odor problems. Installation and completion of wells near the flood protection levee using specialized techniques would be difficult and costly. For these reasons, the restoration of the groundwater affected by OU1 is not practicable. The EPA considers it appropriate to establish ACLs for the groundwater contaminants addressed in OU1.

VII. REMEDIAL ACTION OBJECTIVES

RAOs provide a general description of the goals that the response action is expected to accomplish. The RAOs for this action have been modified from those developed in the FS due to the consideration of ACLs to achieve protection of human health and the environment. The revised RAOs are to:

1) prevent use of groundwater with contaminant levels exceeding MCLs as a drinking water source;

2) prevent further degradation of the groundwater below the Site and in the plume; and,

3) prevent exposure to soil with contaminant concentrations which result in an excess cancer risk greater than 1 X 10^{-6} or a Hazard Quotient greater than 1.

VIII. SUMMARY OF REMEDIAL ALTERNATIVES

The following remedial alternatives were investigated during the FS for OU1. Alternatives are listed with the primary option for groundwater listed first, followed by a slash, then followed by the primary option for the contaminated soil.

Alternative 1	No Action/ No Action
Alternative 2	Institutional Controls/ Institutional Controls
Alternative 3	Monitoring/ Institutional Controls
Alternative 4	Monitoring/ Limited Soil Excavation
Alternative 5	Hydraulic Containment and Monitored Natural Attenuation/ Capping and Sheet Piling
Alternative 6	Groundwater Extraction/ Excavation and Off-site Disposal
Alternative 7	In Situ Bioremediation/ Excavation and On-site Treatment
Alternative 8	In-Situ Physical Treatment/ In-Situ Treatment

In addition to the alternatives evaluated in the FS for OU1, this Proposed Plan introduces a new alternative, 3A, that involves establishing an ACL for the affected groundwater and monitoring to assure that the impact to the Missouri River does not significantly increase. Alternative 3A also imposes well drilling and land use restrictions to control human exposure to contaminated soils and groundwater.

Common Elements

All of the alternatives, except the no action alternative, include institutional controls as a common element. All alternatives facilitate the reasonably anticipated future land use of OU1, which is either recreational or commercial use as a parking lot.

The institutional controls envisioned for each of the designated alternatives include the following elements.

1. A prohibition will be put in place to prevent well drilling in the area which is affected by the groundwater plume associated with OU1. In addition, a control will be imposed that requires consultation with the state and EPA prior to excavation or performing any earth-disturbing activities in the area affected by soil contamination associated with OU1.

2. The institution of a control that would provide access to EPA and MDNR for the purpose of monitoring, maintenance, or any response activities that may become necessary due to concerns related to OU1.

3. The MDNR will attempt to place the properties affected by OU1 contamination on the State Registry of Abandoned or Uncontrolled Hazardous Waste Sites. Appearance on the Registry requires state approval prior to any change in land use or conveyance of the property to a new owner.

4. The USACE well construction guidelines that are implemented by the city of New Haven will continue to control installation of new wells.

Alternative 1: No Action/ No Action

Estimated Capital Cost: $0

Estimated Annual O&M Costs: $5,500

Estimated Present Worth Cost: $164,000

Estimated Construction Timeframe: 0 months

Estimated Time to Achieve RAOs: Indeterminate

The NCP requires that the EPA consider a no action alternative against which other remedial alternatives can be compared. Under this alternative, no further action would be taken to monitor, control, or remediate the groundwater contamination or the soil contamination. However, five-year reviews of the Site are required under CERCLA, so there are very low operation and maintenance (O&M) costs (which occur every five years).

Alternative 2: Institutional Controls/ Institutional Controls

Estimated Capital Cost: $21,000

Estimated Annual O&M Costs: $8,000

Estimated Present Worth Costs: $262,000

Estimated Construction Timeframe: 0 months

Estimate Time to Achieve RAOs: Indeterminate

The institutional controls described above (in the Common Elements Section) would be implemented to limit exposure. While no physical construction would be required, it is estimated that three to six months would be needed to complete the institutional controls.

Alternative 3: Monitoring/ Institutional Controls

Estimated Capital Cost: $35,000

Estimated Annual O&M Costs: $15,000

Estimated Present Worth Costs: $485,000

Estimated Construction Timeframe: 3- 6 months

Estimated Time to Achieve RAOs: Indeterminate

Alternative 3 includes the institutional controls described above (in the Common Elements Section). The contaminated groundwater would be monitored. Three new monitoring wells would be installed. The new and existing

wells would be sampled to track the migration of the plume. It is estimated that three to six months would be needed to install the new monitoring wells and complete the institutional controls.

Alternative 3A: Monitoring/ Institutional Controls

Estimated Capital Cost: $44,000

Estimated Annual O&M Costs: $26,000

Estimated Present Worth Costs: $520,000

Estimated Construction Timeframe: 3- 6 months

Estimated Time to Achieve RAOs: 5 years

Alternative 3A includes the elements of Alternative 3, but monitoring is performed for the purpose of demonstrating attainment of established ACLs. This estimate is slightly higher than the estimate for Alternative 3 due to sampling of the Missouri River. It is estimated that three to six months would be needed to install the new monitoring wells and impose the institutional controls.

Alternative 4: Monitoring/ Limited Soil Excavation

Estimated Capital Cost: $3,450,000

Estimated Annual O&M Costs: $15,000

Estimated Present Worth Costs: $3,900,000

Estimated Construction Timeframe: 12 months

Estimated Time to Achieve RAOs: Indeterminate

Alternative 4 includes monitoring as described in Alternative 3. The institutional controls described above would be implemented to limit exposure. The upper six feet of contaminated soil at the Front Street Site would be excavated. The contaminated soil would be disposed of off site. The excavation would be backfilled with clean fill. The limited excavation and backfilling would minimize human exposure to the contaminants in the soil and allow future limited development of the Site.

Alternative 5: Hydraulic Containment and Monitored Natural Attenuation/ Capping & Sheet Piling

Estimated Capital Cost: $1,601,000

Estimated Annual O&M Costs: $57,000

Estimated Present Worth Costs: $3,300,000

Estimated Construction Timeframe: 10 - 14 months

Estimated Time to Achieve RAOs: Two Years

Alternative 5 includes the institutional controls described above. The contaminated soils would be isolated by enclosing them in a “box” of sheet piling and an asphalt cap. Groundwater in the box would be pumped out to create an inward gradient. Other extraction wells would be placed to prevent further migration of the groundwater plume. The extracted water would be treated with granular activated carbon (GAC) to remove the contaminants prior to discharge to the Missouri River. Once the contaminated soils at the Front Street Site are isolated, natural attenuation processes should begin to reduce the contaminant levels in the plume. Monitoring would be implemented to ensure that the plume is contained and to determine the rates of natural attenuation.

Alternative 6: Groundwater Extraction/ Excavation and Off-site Disposal

Estimated Capital Cost: $20,630,000

Estimated Annual O&M Costs: $68,000

Estimated Present Worth Costs: $21,980,000

Estimated Construction Timeframe: 14 - 18 months

Estimated Time to Achieve RAOs: 20 Years

Alternative 6 includes the institutional controls described above. Extraction wells would be installed to remove the contaminated plume as quickly as possible. The water would be treated with air stripping to remove the contaminants. The contaminated soils would be enclosed in sheet piling and excavated to a depth of approximately 22 feet. The excavated soils would be disposed of off site. Heavily contaminated soils would be sent to hazardous waste landfills, while less contaminated soils would be sent to solid waste landfills. The excavation would be backfilled with clean soil. Monitoring would be implemented to ensure that the plume is being remediated.

Alternative 7: In Situ Bioremediation/ Excavation and On-site Treatment

Estimated Capital Cost: $14,900,000

Estimated Annual O&M Costs: $446,000

Estimated Present Worth Costs: $19,360,000

Estimated Construction Timeframe: 6 Years

Estimated Time to Achieve RAOs: 10 Years

Alternative 7 includes the institutional controls described above. The contaminated groundwater would be treated in-situ (in place) by injecting nutrients into the plume using direct-push technology. As the nutrients mix with the groundwater, they would promote the biodegradation of the contaminants in the plume. The contaminated soils would be enclosed in sheet piling and excavated to a depth of approximately 22 feet. The excavated soils would be treated nearby with solvent extraction to below cleanup levels and used as backfill. Monitoring would be implemented to ensure that the plume is being remediated.

Alternative 8: In-Situ Physical Treatment/ In-Situ Treatment

Estimated Capital Cost: $790,000

Estimated Annual O&M Costs: $60,000

Estimated Present Worth Costs: $1,700,000

Estimated Construction Timeframe: 12-18 months

Estimated Time to Achieve RAOs: 15 Years

Alternative 8 includes the institutional controls described above. The contaminated groundwater and soils would be treated in-situ by physical processes. Advanced remedial technology (ART) wells (an innovative technology) would be used to treat the groundwater plume and the contaminated soils concurrently. ART wells combine in-well air stripping for

groundwater treatment with soil vapor extraction to remediate the soils. Soil vapor extraction wells would be used to supplement the ART wells in treating the heavily contaminated soils at the Front Street Site. Monitoring would be implemented to ensure that the plume is being remediated.

IX. EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different alternatives individually and against each other in order to select a remedy. The nine evaluation criteria are: (1) overall protection of human health and the environment; (2) compliance with Applicable or Relevant and Appropriate Requirements (ARARs); (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume of contaminants through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state/support agency acceptance; and (9) community acceptance. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. A detailed analysis of the original eight alternatives can be found in the FS.

1. **Overall Protection of Human Health and the Environment** *determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.*

Protection of human health and the environment was evaluated by checking to see that each alternative could achieve the RAOs (See Section VII). All of the alternatives, except the no further action alternative, would adequately protect human health and the environment from the contaminants in the groundwater and soil and would meet all the RAOs. Because Alternative 1 (the no action alternative) is not protective of human health and the environment, it was eliminated from consideration under the remaining eight criteria.

2. **Compliance with ARARs** *evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the Site or whether a waiver is justified.*

All of the alternatives, except Alternatives 2 (Institutional Controls) and 3 (Monitoring/Limited Action), would comply with all ARARs. Alternative 2 and Alternative 3 would not meet ARARs unless MCLs were achieved. Since EPA has determined that ACLs are the appropriate attainment criteria, Alternatives 2 and 3 were eliminated from consideration under the remaining seven criteria.

3. **Long-Term Effectiveness and Permanence** *consider the ability of an alternative to maintain protection of human health and the environment over time.*

Alternative 7 would have the lowest long-term risk. All the contaminated soil would be remediated within one year and the groundwater would be remediated within ten years. The treatment technologies used by Alternative 7 are permanent, so long-term risks should remain low.

Alternatives 6 and 8 would also have low long-term risks, but both would take longer to achieve final remediation of the groundwater (and the soil, for Alternative 8) than Alternative 7. The treatment technologies used by Alternatives 6 and 8 are also permanent, so long-term risks should remain low.

By containing the groundwater and the contaminated soils, Alternative 5 would also reduce the long-term risks from the Site. However, since the contaminants would not be treated and would still be onsite, the containment would have to be maintained indefinitely.

Alternative 4 would reduce the risks from soils (by excavating and disposing of the upper six feet of contaminated soil), but would not reduce the risks from the groundwater by using institutional controls. However, this Alternative would allow limited future development of the Site without concerns about intrusive activities.

Alternative 3A would reduce the long-term risks the least. It does not treat, dispose of, or contain any of the contaminants. Instead it relies on institutional controls and monitoring to reduce the risks.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment** *evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.*

Alternative 3A would not reduce the toxicity, mobility, or volume of the contaminants through treatment. The Alterative 3A would use monitoring primarily to ensure that ACLs were being met. The monitoring data could also be used to determine if contaminant toxicity, mobility, or volumes were increasing.

Alternative 5 would reduce the mobility of the contaminants in the groundwater and the soil by containment and reduce the toxicity and volume of the extracted portion of the plume by treatment. Alternative 4 would limit the mobility of the contaminants in the excavated soils by containment (placing them in a RCRA landfill).

Alternative 6 would reduce the mobility and volume of the contaminants in the groundwater through treatment, while Alternatives 7 and 8 would reduce the toxicity and volume of the contaminants in the groundwater and the soil by treatment. Each of these Alternative uses a different treatment process. All of the treatment technologies are irreversible. Alternative 6 would also reduce the mobility of the contaminants in the soil by containment.

5. **Short-Term Effectiveness** *considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.*

In general, alternatives with the fewest construction or intrusive activities pose the lowest risk to site workers and the

community during the remedial action. Alternative 3A requires only a small amount of intrusive work during the drilling and installation of the additional monitoring wells. Short-term risks to workers, the community, and the environment could be controlled by the proper use of personal protective equipment, equipment decontamination, and monitoring during site activities. The risk to the community would be reduced by limiting access to areas where well installations were being conducted. Since no one is currently exposed to contaminated groundwater or soil, only the small number of workers involved in the well drilling operations and sample collection from monitoring wells could be exposed to contaminants. Alternative 3A would also take the least time to implement of the remaining alternatives (only three to six months).

Alternative 8 requires the installation of significantly more wells than Alternative 3A and also requires some trenching, so it would pose more risks than Alternative 3A. Alternative 8 would pose less risk than Alternatives 4, 5, 6, and 7 because it does not require any large-scale excavation or sheet pile installation. Alternative 8 could also be installed fairly quickly (12 to 18 months).

Alternatives 4, 5, 6, and 7 require much more excavation (Alternatives 4, 6, and 7) and/or the installation of sheet piling (Alternatives 5, 6, and 7), so they would pose much more risk than Alternative 3A. These four alternatives would also take much longer to implement (from 10 months for Alternative 5 to 10 years for Alterative 7) than Alternative 3A.

6. **Implementability** *considers the technical and administrative feasibility of implementing the alternative such as relative availability of goods and services.*

The common elements of all the remaining alternatives (institutional controls and groundwater monitoring) are relatively easy to implement. Institutional controls can be difficult to implement, but these difficulties would affect all the alternatives equally. Groundwater monitoring, including the installation of additional monitoring wells, and monitoring the Missouri River are both readily implementable.

Because it would not require any additional work beyond the common elements, Alternative 3A would be the easiest alternative to implement of the remaining alternatives.

Alternative 8 requires the installation of significantly more wells than Alternative 3A and also requires some trenching. In addition, there is only one vendor for the ART wells that would be used in this Alternative. Finally, Alternative 8 would require more access and more coordination with the city, land owners, the ART vendor, and the well driller making it more difficult to implement than Alternative 3A.

Alternatives 4, 5, 6, and 7 would all be much more difficult to implement than Alternative 3A. The groundwater treatment in Alternatives 5 and 6 would require access agreements and coordination between the city, the remedial contractor, the USACE, EPA, and MDNR. The treatment system in Alternative 5 would have to operate for at least 30 years (more likely indefinitely), while the system in Alternative 6 would have to operate for approximately 20 years. The groundwater treatment in Alternative 7 would only require six years, but would require very extensive sampling support and the installation of over 1,000 injection points in the plume. Because of the large number of samples and injection points, the difficulties of coordinating the groundwater remediation (and the extensive concerns with its soil remediation, see below) make Alternative 7 the most difficult alternative to implement.

The soil excavation in Alternatives 4, 6, and 7 and the installation of the sheet piling in Alternatives 5, 6, and 7 would require the closing of Front and Cottonwood Streets. Alternative 4, to a degree, and Alternatives 6 and 7 to a much greater degree would require extensive coordination between the city, the USACE, the excavation contractor, the soil disposal or soil treatment contractor, and the EPA and MDNR. The sampling required to support these alternatives is also extensive and much of it would have to be done on short turnaround, which would increase coordination concerns with the excavation contractor.

7. **Cost** *includes estimated capital and operation and maintenance costs as well as present worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.*

Alternatives 3A has the lowest estimated costs ($520,000). All of the other alternatives have costs at least three times as high. For example, Alternative 8 costs at $1.7 million. The full-scale treatment Alternatives (6 and 7) cost 44 and 39 times, respectively, as much as Alternatives 3A.

These estimates are approximate and made without detailed engineering data. The actual cost of the project would depend on the final scope of the remedial action and on other unknowns. The present net worth costs were calculated using the assumed lives of the alternatives (which range from 10 to 30 years) and a 3.9 percent discount rate.

8. **State/Support Agency Acceptance** *considers whether the state agrees with the EPA's analyses and recommendations of the RI/FS and the Proposed Plan.*

The state of Missouri is conducting a final review of this proposed plan and the preferred alternative concurrent with the public comment period. The state will provide comments to EPA by the end of the public comment period.

9. **Community Acceptance** *considers whether the local community agrees with the EPA's analyses and preferred alternative. Comments received on the Proposed Plan are important indicators of community acceptance.*

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the Site. However, it should be noted that from preliminary discussions with the public and the city of New Haven, Alternative 3A satisfies two key preferences expressed by the local community. Alternative 3A provides parking capacity to support the nearby Missouri River access point. Parking has been identified as a critical need by the city.

Also, Alternative 3A can be fully implemented before the Lewis and Clark Bicentennial Celebrations (scheduled for early summer 2004). The city expects a multitude of visitors to the downtown area during the celebrations, and parking capacity is a key logistical concern in accommodating the planned events. Alternative 3A allows the city to address the critical need for parking in a timely manner and supports a future use of the Site that the city and community need and therefore is sustainable.

The nine evaluation criteria used to compare alternatives are presented in the box below. A "Detailed Analysis of Alternatives" for the original eight alternatives can be found in the FS. A description and evaluation of Alternative 3A is included in this section.

Alternative 3A: Monitored Attainment of ACLs/ Institutional Controls

Alternative 3A would use groundwater and river monitoring and institutional controls to address the potential health risks associated with the contaminated groundwater. This alternative would not actively restore the aquifer, but would monitor the plume and the Missouri River to ensure that any conditions that could result in a significant increase in impact to the adjacent Missouri River is detected and addressed. Institutional controls would be used to control potential human exposure to contaminated soils and groundwater.

A detailed sampling and quality assurance plan would be developed before the monitoring activities began. The sampling and quality assurance plans would include sample locations, sampling frequency, sampling procedures, sample analysis methods, and sample documentation procedures. Wells from the existing monitoring well network would be used as much as possible to avoid duplication of effort and to minimize the number of new monitoring wells installed. New monitoring wells would be added to the existing monitoring well network to provide further definition of the plume and to provide data on especially important areas of the plume, such as the highly contaminated center line and source area portions.

For this alternative, three new monitoring wells would be installed. Wells on the land side of the levee would be provided with a locking valve or sealable flange to prevent the well from becoming artesian when the Missouri River floods. The existing well (Well G) on the river side of the levee would also be retrofitted with a locking valve or flange and would be installed inside a well vault that can be submerged during the annual flood. In addition, the wells would comply with other guidelines of the USACE. These requirements can be found at http://www.nwk.usace.army.mil/local_protection/levees.html.

The new and existing wells will be sampled quarterly for two years to establish baseline conditions then twice a year for the next three years. ACLs will be established at a level one order of magnitude above the highest concentrations detected during the initial two years of monitoring. Thereafter, the wells will be sampled annually. The Missouri River will be sampled annually. This sampling will continue until the first five-year review. If ACLs are not exceeded at that time, Missouri River sampling will be discontinued.

Because contaminants remain in place for Alternative 3a, a five-year review is required. During the five-year review process, the EPA and MDNR will evaluate the scope and frequency of the monitoring program and make revisions if necessary.

Institutional controls would be implemented to minimize human contact with the contaminated groundwater. The institutional controls would prohibit well drilling in the affected area and require city approval, after consultation with EPA and MDNR, prior to excavating any soil in the affected area or any other activity that would disturb potentially contaminated soils.

Alternative 3A - Evaluation

This alternative would include monitoring of groundwater and the Missouri River, and reliance upon institutional controls to prevent exposure to contaminated groundwater and soils. This alternative would not actively restore the groundwater or soil. This alternative would monitor the plume to ensure conditions that would significantly increase the impact to the adjacent Missouri River are detected and addressed. Monitoring would be accomplished through the collection and analysis of groundwater and river samples. Institutional controls would consist of a combination of local controls, easements, and deed restrictions.

Alternate Concentration Limits (ACLs)

OU1 meets the three conditions set forth in CERCLA 121(d)(2)(B)(ii) for establishing alternate concentration limits (ACLs):

1. The contaminated groundwater discharges to surface water at known or projected points;
2. The groundwater discharge does not lead to "statistically significant" increases in the contaminants in the surface water; and
3. Enforceable measures can be implemented to prevent human consumption of the contaminated groundwater.

In addition, EPA has determined that restoration of the shallow groundwater affected by OU1 is not practicable. Therefore, EPA has determined that ACLs can appropriately be established for the contaminated groundwater in OU1. Attaining these ACLs will assure protection of human health and the environment in lieu of meeting MCLs for the groundwater.

Overall Protection of Human Health and the Environment

Under Alternative 3A, protection of human health is achieved by attaining ACLs which are designed to prevent deterioration of surface water conditions, and through institutional controls consisting of local controls, easements and deed restrictions on the affected properties. Use of the contaminated aquifer is further controlled by the USACE well construction guidelines in the affected area. The imposition of controls prohibiting excavation of soil or other earth-disturbing activity without approval of the city, after consultation with EPA and MDNR, would control potential exposure to contaminated soils in the affected area. Potential appearance of the Site on the State Registry provides further protection by requiring state approval for any change in land use or conveyance of the property.

Contaminants in source area soil would continue to desorb and migrate into the groundwater and continue to ultimately

discharge into the Missouri River. Monitoring would be performed to assure that the levels of contamination in the groundwater do not increase to the point that would significantly increase contaminant levels in the Missouri River. Monitoring also affords protection of the environment by detecting any expansion of the plume or migration of the plume towards new sensitive receptors.

Compliance with ARARs

The concentrations of PCE, TCE, cis-DCE, and VC in the groundwater currently exceed the National Primary Drinking Water Standards., 40 CFR Part 141, Subparts B & G. (MCLs). Contaminated soils would continue to act as a source of groundwater contamination at levels that would exceed MCLs. However, restoration of the groundwater to achieve MCLs has been deemed not practicable, based on a balancing of the remedy selection criteria. Therefore, ACLs will be achieved for the contaminated groundwater in OU1 in lieu of meeting MCLs.

The Missouri Monitoring Well Construction Code (10 CSR 23-4.010) and the USACE requirements for work near a flood levee would apply to the construction of the monitoring wells in this alternative.

Long-Term Effectiveness and Permanence

The residual risk to human health and the environment associated with Alternative 3A would be controlled by attainment of ACLs and institutional controls preventing exposure to contaminated soils and groundwater. Monitoring of the groundwater and the Missouri River would be conducted to evaluate the effectiveness of this alternative; however, no monitoring of the soil contamination would be included. Because contamination above the cleanup goals would remain at the Site, five-year reviews are required by the Superfund statute. The long-term effectiveness of the multiple layers of institutional controls and permit guidelines for well installation provide a high level of assurance that potential exposure to Site contaminants will continue to be controlled.

O&M activities associated with Alternative 3A would include groundwater and river monitoring and the five-year reviews. No difficulties or uncertainties are foreseen during the performance of these activities.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Actions taken under Alternative 3A would not reduce the toxicity, mobility, or volume of the contaminants except through natural fate and transport processes. Monitoring would be effective in determining any reductions of the toxicity, mobility, or volume of the contaminants in the groundwater. No mechanisms would be in place to monitor the reductions, if any, of the toxicity, mobility, or volume of the contaminants in the soil.

Short-Term Effectiveness

There would be a minimal increase in the short-term risk to the workers, the community, or the environment during installation of the new monitoring wells. The amount of time required for the contaminants in the groundwater and soil to degrade or dilute to concentrations at or below the risk-based levels is unknown, but is expected to be greater than 30 years. Design and installation of additional monitoring wells could be accomplished in several months.

Implementability

Groundwater monitoring, including installation of additional monitoring wells, is readily implementable. Monitoring the Missouri River is also readily implementable. Instituting local controls is readily implementable. Placement and design of the monitoring wells would be coordinated with the city of New Haven and USACE. Wells on the land side of the levee would be designed with locking valves to prevent the well from becoming artesian during flood events. Wells on the river side of the levee would have be installed in submergible well vaults. Well permitting requirements for the new monitoring wells would be implemented and overseen by the city of New Haven, the County Commission, or the state of Missouri. The services, materials, and personnel needed to complete the required five-year reviews are readily available.

Cost

This alternative would have minimal capital costs consisting of installation of three new monitoring wells. No costs are associated with actions taken by the city to impose institutional control on the affected properties. O&M costs would include monitoring of groundwater and the Missouri River and performance of five-year reviews. The total present worth of Alternative 3A is estimated to be $520,000.

State Acceptance

The state of Missouri is conducting a final review of this alternative concurrent with the public comment period, and will provide comments to EPA following conclusion of the public comment period.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD.

X. PREFERRED ALTERNATIVE

The EPA's preferred alternative is Alternative 3A. This alternative has several elements that combine to assure protection of human health and the environment. The alternative would achieve all RAOs by preventing exposure to contaminated groundwater and soils through multiple layers of institutional controls.

Monitoring wells will be used to monitor the PCE plume within the alluvial aquifer. After evaluating this data, ACLs will be established for PCE, TCE, cis-DCE, and VC. In consideration of the multiple margins of safety demonstrated in the ACL analysis described previously, the ACL for each of the four contaminants will be established at a level one order of magnitude greater than the maximum concentration of each contaminant detected during the initial year of quarterly monitoring. If subsequent sampling detects the presence of any of the four contaminants at levels which exceed the established ACL, EPA and the state will evaluate the potential impact to human health and the environment and determine if additional mitigative measures are required.

Following establishment of ACLs, monitoring of groundwater will continue the next year on a quarterly basis. For the next three years, groundwater sampling will be conducted semi-annually. Thereafter, annual groundwater sampling will be conducted. Missouri River sampling will be conducted annually, with river sampling conducted during the month with the lowest historical average flow conditions. This sampling will continue until the first five-year review. If ACLs are not exceeded at that time, Missouri River sampling will be discontinued.

Institutional controls will be imposed through deed restrictions or other mechanisms to control exposure to contaminated groundwater and soils. These controls will prohibit well drilling in the affected area and require consultation with the state and/or EPA prior to excavation or any earth-disturbing activity conducted in the designated affected area.

In addition, these controls will provide for access for MDNR and/or EPA to perform any necessary monitoring, maintenance, or response activity. Further institutional controls include potential listing on the State Registry. Well construction requirements are currently in place and will remain in effect.

Since the remedy leaves contaminants in place, five-year reviews will be conducted as required by the Superfund Statute until such time that uncontrolled exposure to contaminant levels in soil and groundwater do not pose an unacceptable risk to human health and the environment. During each five-year review, the monitoring regimen will be reviewed and modified, as appropriate, assuring that sufficient data continue to be generated to compare contaminant levels in groundwater to established ACLs.

Based on the information currently available, EPA believes the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b):1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and 5) justifies not meeting the preference for selecting remedies with treatment as a principal element.

GLOSSARY

Of Terms Used In the Proposed Plan

This glossary defines many of the technical terms used in this Proposed Plan.

Aquifer: An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces, or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be tapped and used for drinking or other purposes. The water contained in the aquifer is called groundwater.

Bedrock: The layer of rock located below the overburden soils. Bedrock can be unweathered (solid and unaltered), weathered (altered by water, exposure to the elements), or fractured (altered by earth's movements). Aquifers can be found in certain types of bedrock.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The acts created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program, EPA can either: 1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work; or, 2) take legal action to force parties responsible for site contamination to clean up the site or pay back the federal government the cost of the cleanup.

Chemicals of Concern (COCs): Contaminants, identified during the site investigations and risk assessments, that pose a potential risk because of their toxicity and potential routes of exposure to public health and the environment.

Groundwater: Water, filling spaces between soil, sand, rock and gravel particles beneath the earth's surface, that often serves as a source of drinking water.

Institutional Controls: Controls placed on property to restrict access and future development.

Maximum Contaminant Levels (MCLs): The maximum permissible level of a contaminant in water that is or may be consumed as drinking water. These levels are determined by EPA and are applicable to all public water supplies.

Monitoring Wells: Special wells installed at specific locations on or off a hazardous waste site where ground- water can be sampled at selected depths and studied to determine such things as the direction in which the ground- water flows and the types and concentrations of contaminants present.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The Federal regulation that guides the Superfund program.

Operation and Maintenance (O&M): Activities conducted at a site after response actions occur, to ensure that the cleanup or containment system continues to be effective.

Plume: A body of contaminated groundwater flowing from a specific source. The movement of the groundwater is influenced by such factors as local groundwater flow patterns, the character of the aquifer in which groundwater is contained, and the density of contaminants.

Present Worth: The amount of money necessary to secure the promise of future payment or series of payments at an assumed interest rate.

Toxicity: A measure of the degree to which a substance is harmful to human and animal life.